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APPARATUS AND METHOD FOR FISHING LINE SPLICING

BACKGROUND OF THE INVENTION

This invention relates in general to a device and method for linearly connecting strand materials and more particularly to a device which facilitates the connection of fishing lines.

In many types of fishing, and particularly in fly fishing, it is necessary or desirable to linearly connect sections of fishing line, either because of different properties of the sections or to repair a break. A fly fisherman must be equipped with a fishing rod, a fishing line called a fly line, a device such as a reel to hold the fly line, a leader line commonly called a leader, and flies. A leader is a relatively short, fine, tapered segment of monofilament line, with its larger or butt end attached to the fly line and its smaller or terminal end to the fly.

Fly fishing involves casting a line a substantial distance over a body of water wherein only the weight of the line is used to effect the cast. A skilled fly caster typically uses a tapered line and a tapered leader at the end of this line. One of the more difficult aspects of fly fishing involves connecting the end of the leader to the end of the fishing line by tying a knot. The knot must be specially selected to avoid kinks and/or slip-separation of the leader from the line.

Typically, a leader will range from as short as 5 or 6 feet to as long as 12 to 15 feet. Some leaders possess a true taper, that is, they undergo a gradual change in diameter from the butt end to the terminal end without any interruptions in the leader material. Other leaders consist of lengths of varying diameter leader material tied together. Many fishermen favor the latter, that is the knotted leader, in that it enables them to tailor the leader to their own needs. But irrespective of whether the fisherman uses a truly tapered leader or a knotted leader, the fisherman will usually find it necessary to replace the end section or segment of the leader, often called the tippet, for this is where the leader is thinnest and weakest, and where it will break if its capacity is exceeded. Tippet replacement and repair usually require a fisherman to form a knot. Moreover, when a fisherman changes to a smaller fly, a thinner tippet is often required. Hence, the typical fisherman must tie knots from time to time in leader material, which is usually monofilament line.

The knots which join the lengths of leader material either to the fly line or to other leader sections must accommodate the varying diameters of material and must be strong. Nail knots and Albright knots meet these requirement, but are time consuming to tie and require skill, good eyesight and considerable manual dexterity. Moreover, the knot is usually the weakest part of the fish line and may cause the breaking of the fish line at the knot. Thus, there remains a need for a quick and easy device and method for strong linear connection of fishing lines.

BRIEF SUMMARY OF THE INVENTION

A splice system and method for linear connection of fishing lines include a female connector and a male connector. The female connector has an outer surface, first and second opposite ends, and a longitudinal axis. The outer surface has an aperture disposed thereon. The first end is connected to a first fishing line section and the second end has an opening therein. The connector has a coaxial interior feature with a radial extent. The male connector has first and second opposite ends and a longitudinal axis. The second end is connected to a second fishing line section and the first end is configured for coaxial insertion into the opening of the female connector. The second end has a radial extent greater than the radial extent of the interior feature of the female connector. At least one of the connectors is resilient so that the second end of the male connector compresses or the interior feature of the female connector expands to allow passage of the second end of the male connector axially past the interior feature.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is top plan view of one embodiment of the splice system of the present invention.

FIG. 2 is a side cross-sectional view along line 2-2 of FIG. 1, showing the connectors of the splice system in a connected configuration.

FIG. 3 is a side cross-sectional view of another embodiment of a connector of the splice system.

FIG. 4 is a side cross-sectional view of yet another embodiment of a connector of the splice system.

FIG. 5 is a side elevation view of a card holding multiple female connectors.

While the above-identified drawing figures set forth preferred embodiments of the invention, other embodiments are also contemplated, as noted in the discussion. In all cases, this disclosure presents the invention by way of representation and not limitation. It should be understood that numerous other modifications and embodiments can be devised by those skilled in the art which fall within the scope and spirit of the principals of this invention. The figures may not be drawn to scale. Like reference numbers have been used throughout the figures to denote like parts.

DETAILED DESCRIPTION

FIG. 1 is perspective view of one embodiment of the splice system of the present invention. Splice system 10 connects fly or fishing line 12 and leader 14 or other fishing line segments which are aligned generally along longitudinal axis 15 for connection. Splice system 10 includes two main components: male connector or bullet connector 16 and female connector or receiver 18. An exemplary embodiment additionally includes slidably mounted floats 20.

In an exemplary embodiment, bullet connector 16 is secured to leader 14 and receiver 18 is secured to fly line 12. In an exemplary embodiment, leader 14 is permanently secured to bullet connector 16. Attachment of leader 14 to bullet connector 16 can be accomplished during manufacturing or can occur after each component has been produced. Suitable attachment methods include molding of leader 14 and bullet connector 16 as an integral unit or joining leader 14 and bullet connector 16 with a suitable adhesive, for example. In an exemplary embodiment, fly line 12 is removably secured to reusable receiver 18 by knot 28.

FIG. 1 illustrates bullet connector 16 prior to its connection to receiver 18. Bullet connector 16 moves in advance direction 22 for insertion into first opening 23 of receiver 18. When bullet connector 16 is inserted into receiver 18, radially extending petals 24 engage with an interior feature of receiver 18 to prevent disengagement of bullet connector from receiver 18 in reverse direction 26. Thus, bullet connector 16 is a "one-way" connector that can only be removed from receiver 18 in advance direction 22. Aperture 30 is provided on a surface of receiver 18. To disconnect bullet connector 16 and receiver 18, a user advances bullet connector 16 in direction 22 out of receiver 18 through aperture 30. The user can then cut

leader 14 to remove bullet connector 16 and leader 14 from receiver 18. The user can then insert another leader 14 with bullet connector 16 into first opening 23 of receiver 18 to connect leader 14 and fly line 12. In use, tensile forces on the assembly in opposite directions 22 and 26 prevent unintentional disengagement of bullet connector 16 and receiver 18.

When bullet connector 16 and receiver 18 are fully connected, thereby connecting leader 14 to fly line 12, a fisherman can cast fly line 12 and leader 14 over the water to place fly 34, attached to end 35 of leader 14, into the body of water. In an exemplary embodiment, a connected system 10 of bullet connector 16 and receiver 18 is less than about 1.0 inch (25.4 mm) long and less than about 0.140 inch (3.56 mm) in diameter. In some embodiments, fly line 12 is about 0.032 inch (0.81 mm) to about 0.042 inch (1.07 mm) in diameter. In some embodiments, leader 14 is about 0.020 inch (0.51 mm) to about 0.026 inch (0.66 mm) in diameter. Splice system 10, with its low profile, small size, light weight, elongated shape and circular cross section is advantageous over other connection methods in that it is easy to use, very small, lightweight, and aero- and hydrodynamic. The shape and size allow a fly line 12 and leader 14 connected by splice system 10 to glide easily through air and water without disrupting the flow of the fishing line in casting. In an exemplary embodiment, bullet connector 16 and receiver 18 are each molded from a lightweight, resilient and durable material such as plastic or nylon. Nylon 66, available from E.I. Du Pont de Nemours and Co., Inc., Wilmington, Delaware, is used in one suitable embodiment.

In one embodiment, floats 20 can be used with splice system 10 to provide buoyancy to the connection. In another embodiment, buoyancy is incorporated into bullet connector 16 and/or receiver 18 by using buoyant materials or adding buoyant features such as dispersed hollow glass beads in the bulk material. In one embodiment, each float 20 is formed of a closed-cell or open-cell foam and can be configured as a tapered cylinder having axial bore through which either fly line 12 or leader 14 can pass to secure float 20. In one exemplary embodiment, float 20 is formed of open-cell foam having a specific gravity of at least about 0.5. In one exemplary embodiment, float 20 is formed of extruded open-cell foam having a specific gravity of less than about 0.6. Floats 20, when brightly colored, are functional as strike indicators because they visibly signal movement of leader 14 and fly 34 during a fish strike.

In some applications, floats 20 are not used because a sinking line is preferred. In that case, sinking ingredients such as tungsten powder can be incorporated into bullet connector 16 and/or receiver 18, or a sinking member may be used in place of floats 20. Moreover, the sinking member or float 20 may be colored to render it highly visible by day or night or camouflaged, as desired. Other treatments for the components of splice system 10 include protection against ultraviolet light. In one embodiment, each float 20 is radially symmetrically disposed and includes tapered surface 32 to enhance the movement of splice system 10 through air and water. Tapered surface 32 is symmetric about axis 15 and extends from a narrow diameter near distal end 33 to a greater diameter toward bullet connector 16 or receiver 18, respectively.

FIG. 2 is a side cross-sectional view along line 2-2 of FIG. 1, showing the connectors of the splice system in a connected configuration. Bullet connector 16 includes head 36 and a plurality of resiliently deformable petals 24, the plurality of petals 24 having a radial extent greater than the radial extent of head 36. Bullet connector 16 is shaped to facilitate its advance in direction 22 through axial bore 38 of receiver 18 and, once fully inserted into receiver 18, to prevent its motion in direction 26 through bore 38. In an exemplary embodiment, head 36 has a hemispherical shape and each petal 24 has a narrow width at head 36 and gradually widens in a direction away from head 36. In the illustrated embodiment, leader 14 is integrally formed with bullet connector 16. This can be accomplished, for example, by molding bullet connector 16 over or with leader 14 so that they form an inseparable unit.

In one embodiment, receiver 18 includes interior annulus 40 having axial bore 38 therethrough and defining radially extending shoulder 42. Axial bore 38 is wide enough to allow the passage of fly line 12 but not wide enough to allow the passage of knot 28 formed at the end of fly line 12. Cavity 46 is wide enough to accommodate knot 28 and deep enough to accommodate knot 28 and bullet connector 16 while allowing space for bullet connector 16 to exit aperture 30.

To attach fly line 12 to receiver 18, a user threads fly line 12 from first end 48 of receiver 18 toward second end 50. The user then ties knot 28 in fly line 12. If excess fly line 12 extends beyond knot 28, the user can trim off the extra length if desired. The user then pulls fly line 12 back in the direction of first end 48 to seat knot 28 against shoulder 42. With

fly line 12 thereby connected to receiver 18 and leader 14 connected to bullet connector 16, fly line 12 and leader 14 can be connected to each other by moving bullet connector 16 along axis 15 into cavity 46 of receiver 18. A permanent snap connection is facilitated by the radial expansion of petals 24 of bullet connector 16 after they have passed over an interior feature such as raised annulus 52 on the interior surface of receiver 18.

In one exemplary embodiment, as bullet connector 16 is advanced from second end 50 of receiver 18 past interior annulus 52, the hemispheroidal shape of head 36 bullet connector 16 facilitates its movement through bore 54. A radial extent, such as half of an outer diameter, of petals 24 (in an uncompressed state) is greater than a radial extent, such as half of an inner diameter, of annulus 52. As the bullet connector 16 is advanced past the annulus 52, the petals 24 are resiliently radially inwardly compressed to fit through the annulus 52. When petals 24 have passed annulus 52, an audible snap or click is heard, and a tactile click is also felt, as petals 24 of bullet connector 16 resiliently return to their uncompressed dimension. In particularly suitable embodiments, either one or both of bullet connector 26 and radial annulus 52 resiliently deform to allow petals 24 to move past annulus 52 and then return to about the original dimension. Such resilient deformation can be accomplished by the choice of materials and the geometry of bullet connector 16 and receiver 18. The shape of head 36 can take other forms, such as a tapered cone shape, for example. The shape of petals 24 can similarly take other forms, such as radial ribs, stems, and detents, for example.

In an exemplary embodiment, annulus 52 has a flat surface 56 which projects radially inward and faces free ends of petals 24 to prevent petals 24 from slipping back past annulus 52. In one embodiment, an outer diameter of bullet connector 16 at petals 24 is slightly larger than an inner diameter of cavity 46 to facilitate an interference fit of bullet connector 16 in receiver 18, thereby leading to an even more secure connection. In a particularly suitable embodiment, flat surface 56 is slightly undercut (i.e., moving radially outward from axis 15, flat surface 65 slopes toward second end 50) so that annulus 52 forms an annular barb which further prevents the disconnection of bullet connector 16 and receiver 18. In an exemplary embodiment, head 36 has a largest diameter of about 0.068 inch (1.72 mm); bullet connector 16 at petals 24 has a largest diameter of about 0.093 inch (2.36 mm); bore 54 has an inner diameter of about 0.068 inch (1.72 mm); and cavity 46 has an inner diameter of about 0.099 inch (2.51 mm). In each case, a radial extent is half of a diameter.

Because the outer diameter of petals 24 is greater than the inner diameter of annulus 52, the passage of petals 24 into cavity 46 forms a permanent and strong connection between bullet connector 16 and receiver 18, thereby connecting leader 14 and fly line 12. In an exemplary embodiment, the materials and dimensions of bullet connector 16 and receiver 18 are chosen so that bullet connector 16 and receiver 18 cannot be separated with manual tensile or separation force along axis 15 of at least about 8 pounds (3.6 kg). In an especially suitable embodiment, bullet connector 16 and receiver 18 cannot be separated with tensile or separation force along axis 15 of at least about 10 pounds (4.5 kg). Nylon is an especially suitable material for bullet connector 16 and receiver 18 because it swells slightly in water, leading to an even stronger interference connection between bullet connector 16 and receiver 18.

FIG. 3 is a side cross-sectional view of another embodiment of a connector of the splice system. In the illustrated embodiment, receiver 18 includes annular grooves 58 on an exterior surface at each of first end 48 and second end 50. Grooves 58 are configured to mate with raised annuli 60 on floats 20 for secure connection of floats 20 onto first end 48 and second end 50 of receiver 16.

To initially use splice system 10, a user obtains leader 14 with attached bullet connector 16. A user attaches fly line 12 to receiver 18 as discussed above. The user attaches leader 14 to fly line 12 by inserting bullet connector 16 into receiver 18 to form a permanent, locked connection.

To replace leader 14 with a different leader 14, the user removes the old leader 14 by moving bullet connector 16 in advance direction 22 out of aperture 30 of receiver 16. While interference of petals 24 and annulus 52 prevents movement in direction 26, movement of bullet connector 16 from receiver 18 in direction 22 is allowed. Leader 14 can be cut at severance point 62 near bullet connector 16 or severance point 64 near float 20. If cut at point 62, leader 14 is removed by pulling leader 14 in direction 26. If cut at point 64, leader 14 is removed from receiver 18 by pulling bullet connector 16 in direction 22 out aperture 30. The severed portions of leader 14 can be discarded along with bullet connector 16.

A new leader 14 connected to new bullet connector 16 is obtained. Float 20 is removed from end 50 of receiver 18. Distal end 35 (see FIG. 1) of leader 14 is threaded through float 20 so that bullet connector 16 is proximate the end of float 20 which connects to

receiver 18. Bullet connector 16 is moved axially through bore 54 so that petals 24 pass radial annulus 52, resulting in the connected position of bullet connector 16 and receiver 18 shown in FIG. 2. Float 20 is thereafter reattached to receiver 20. Thus, a fisher may be supplied with multiple sets of leaders 14, each with an attached bullet connector 16, but requires only one fly line 12 with attached receiver 18.

FIG. 4 is a side cross-sectional view of yet another embodiment of receiver 18 of splice system 10. Receiver 18 further includes internal ramp surface 66 to aid in diverting bullet connector 16 out of aperture 30. As discussed above, receiver 18 is reusable and thus does not need to be replaced to change leader 14. However, if receiver 18 is damaged or otherwise requires replacement or repositioning on fly line 12, it can also be easily replaced or repositioned. A user moves knot 28 of fly line 12 in direction 26 out aperture 30 of receiver 18. Fly line 12 can be cut at severance point 66 near knot 28 or severance point 68. If cut at point 66, fly line 12 is removed from receiver 18 by pulling fly line 12 in direction 22. If cut at point 68, fly line 12 is removed from receiver 18 by pulling knot 28 in direction 26 out of aperture 30. The severed end of fly line 12 can be discarded along with receiver 18. The newly cut end of fly line 12 can be inserted into a new receiver 18 and knot 28 tied as discussed above.

FIG. 5 is a side elevation view of a card 72 holding multiple receivers 18. Card 72 provides for convenient storage of, and easy accessability to, receivers 18. Card 72 is easily stored in a user's vest pocket, providing a convenient storage unit for receivers 18, which might otherwise be easily lost because of their small size. An added convenience is that a user can thread fly line 12 through receiver 18 and tie knot 28 while the receiver 18 is held on card 72, thus reducing the risk of dropping and losing the receiver 18 while tying on fly line 12. In one embodiment, receivers 18 are integrally molded with card 72, leaving connecting members 74 and 76 at first end 48 and second end 50 of each receiver 18, respectively.

FIG. 5 also illustrates the process of removal of one receiver 18 from card 72. In one embodiment, each connecting member 74 and 76 secures the respective receiver 18 to card 72 during routine handling, but is easily broken with manual force for the removal of a receiver 18 from card 72.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.